637.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

637.4 Measurement

Each illuminated sign system completed and accepted at the location specified is measured for payment per Lump Sum.

637.4.01 Limits

General Provisions 101 through 150.

637.5 Payment

Each illuminated sign system measured for payment will be paid for at the Lump Sum price bid for each system. Price and payment is full compensation for furnishing and installing each complete and functional system, including designs when furnished by the Contractor, drawings, electrical apparatus and wiring specified, required excavation, backfill, concrete for conduits, and other materials, labor, equipment, and incidentals to complete the Item.

Structural supports for overhead highway signs will be erected and paid for separately according to Section 638. Signs will be paid for according to Section 636.

Payment will be made under:

Item No. 637	Illuminated sign system—sta.___	Per lump sum

637.5.01 Adjustments

General Provisions 101 through 150.

Section 638—Structural Supports for Overhead Signs

638.1 General Description

This item includes the materials, design requirements, fabrication, and erection of structural supports for overhead signs, including excavation, foundations, anchor bolt assemblies, backfill, redressing, and regrassing but exclusive of signs.

638.1.01 Definitions

Structural supports for overhead signs are defined generally as follows:

Type	Description
I	A SIGN BRIDGE type structure that spans the roadway with more than two horizontal chords supported by two columns, one at each end. Each column shall have at least two braced vertical members. A walkway is required.
II	A CANTILEVER type structure with two or more horizontal chords supported by a single column at one end. A walkway is required.
III	A BUTTERFLY type structure with two or more horizontal chords extending an equal distance in opposite directions from a single column. Walkways are required.
IV	A COMBINATION (Bridge-Cantilever) type structure with more than two horizontal chords supported by two columns, only one at one end and one at an intermediate point. Each column shall have at least two braced vertical members. Walkways are required.
V	A CANTILEVER type structure with a maximum of two horizontal chords supported by a single column at one end. A walkway is not required.
VI	A SIGN BRIDGE type structure that spans the roadway with a maximum of two horizontal chords supported by two columns, one at each end. A walkway is not required.
VII	A BRIDGE MOUNTED (attached to a highway bridge) structural frame with a walkway.
VIII	A BUTTERFLY type structure with a maximum of two horizontal chords extending an equal distance in opposite directions from a single column. Walkways are not required.

Type II and V structures' maximum horizontal dimension shall be 32 ft (9.75 m). The horizontal dimension is measured from the column's centerline to the furthest point of the structure or sign.

Type III and VIII structures' maximum horizontal dimension shall be 25 ft (7.6 m). The horizontal dimension is measured from the furthest point of the structure or sign on one side to the furthest point of the structure or sign on the other side. Place the sign(s) on the structure to create a slightly unbalanced condition about the column's centerline during wind loads.

Types V, VI, and VIII structural supports shall be used with flat sheet aluminum signs. If the vertical dimension of the largest sign is 42 in (1050 mm) or less, one horizontal chord may be used.

638.1.02 Related References

A. Standard Specifications

Section 207—Excavation and Backfill for Minor Structures

Section 500—Concrete Structures

Section 501—Steel Structures

Section 511—Reinforcement Steel

Section 645—Repair of Galvanized Coatings

Section 700—Grassing

Section 833—Joint Fillers and Sealers

Section 852—Miscellaneous Steel Materials

B. Referenced Documents

1994 Edition of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals,

AASHTO Standard Specifications for Highway Bridges

Current edition of the Manual on Uniform Traffic control Devices for Streets and Highways (MUTCD)

Current issue of ASTM Standards of the American Society for Testing and Materials

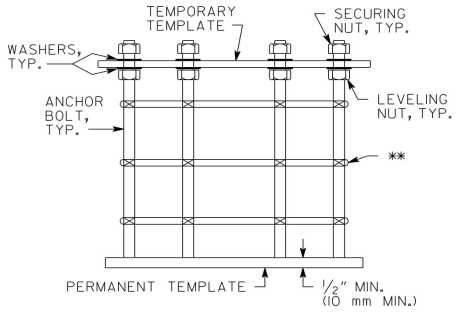
American National Standards Institute (ANSI)

American Petroleum Institute (API)

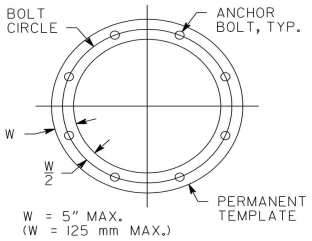
Current issue of AASHTO Standard Specification for Transportation Materials and Methods of Sampling and Testing

638.1.03 Submittals

Submit to the Engineer 6 sets of shop drawings [(12 in x 18 in (305 x 457 mm)] half size plan sheets) and 2 sets of design calculations [8.5 in x 11 in (216 x 297 mm)] sheets, neatly bound and indexed] for the Structural Supports, anchor bolt assemblies, and foundations for review and approval. Also send a copy of your transmittal letter to the State Traffic Detail the shop drawings to permit replacement of all members and include all dimensions, construction tolerances, elevations at top and bottom of foundations, and sizes of members. The shop drawings shall include the material designations of the structure and of the hardware for attaching the sign, the lane delineation of the roadway under the structure, and the walkway. See Figure 1, Figure 2, and Figure 3.



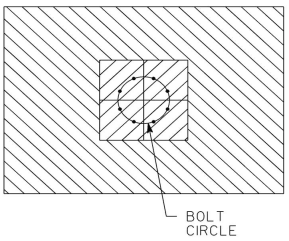
** - #4 STIRRUPS AT 12" MIN. TIED, TYP.
(#13 STIRRUPS AT 300 mm MIN. TIED, TYP.)



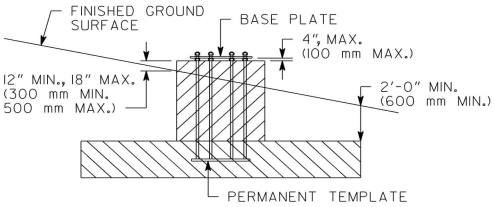
W = 5" MAX.
(W = 125 mm MAX.)

SECTION A-A

FIGURE 1



PLAN

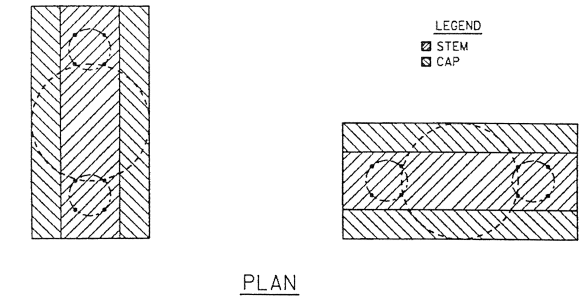


ELEVATION

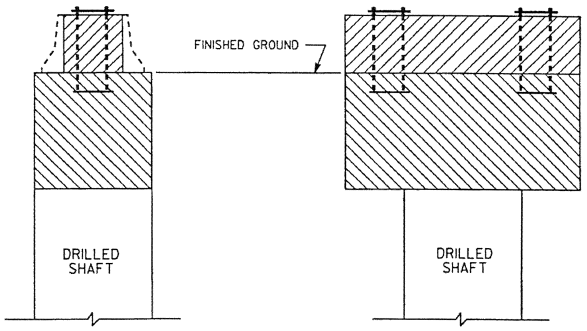
LEGEND
STEM
FOOTING

REINFORCEMENT STEEL NOT SHOWN IN STEM AND FOOTING.

FIGURE 2



PLAN



ELEVATION

REINFORCEMENT STEEL NOT SHOWN IN STEM, CAP AND DRILLED SHAFT.
SEE FIGURE 1 AND FIGURE 2 FOR ADDITIONAL DETAILS.

FIGURE 3

A. Structural Supports

Design structural supports to use interchangeable components whenever feasible.

Design Type I, IV, and VI supports for 100% of the design sign area shown on the Plans and 100% of the wind pressure as calculated by the AASHTO Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals.

Design bases for a minimum of four anchor bolts per column.

Design Type II, III, V, and VIII supports for 100% of the design area shown on the Plans and 150% of the wind pressure as calculated by the AASHTO Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals. Design bases for a minimum of 8 anchor bolts per column.

Design Type VII supports for 100% of the design sign area shown on the Plans and 100% of the wind pressure as calculated by the AASHTO Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals.

Type VII bridge mounted structural frames may be attached to concrete barrier, parapet, or deck or steel beams. Structural Supports shall not be attached to prestressed, post-tensioned, or reinforced concrete beams unless inserts were placed in beams during fabrication or construction. Make attachments to the concrete by bolting through the concrete or using chemical anchors. Mechanical anchors will not be allowed.

Attachments shall be flush on the traffic side of the concrete barrier, parapet, or deck. No attachments shall be welded to beams. When bolting to ASTM A 709 Grade 50W (A 709 M Grade 345 W) steel; bolts, nuts and washers shall be made from a steel that meets mechanical properties of ASTM A 325 (A 325M) and has weathering characteristics comparable and compatible to ASTM A 709 Grade 50W (A 709 M Grade 345W) steel. If the Structural Support is attached to a bridge beam, additional bracing will be required between the exterior beam and the first interior beam.

B. Walkways

When required by the sign type, place walkways in front of the signs and extend them at least 1 ft (300 mm) outside of the edge of all overhead signs and at least 2 ft (600 mm) outside of the right edge of paving, or as directed by the Engineer. Provide walkways in front of the lower front chord, and do not locate a portion higher than the lowest part of any sign. Make the walkway continuous from end to end with a railing along the front side that can be folded down flush with the walkway when not in use.

C. Anchor Bolt Assemblies

Anchor bolt assemblies shall be of the proper length, area, and perimeter to transfer loads from the base plates to the foundations. The permanent template may be used in developing anchor bolts. Anchor bolts shall be at least 1-1/2 in. (38 mm) in diameter. Anchor bolt assemblies shall consist of a permanent template at the base, anchor bolts, leveling nuts, washers, temporary template, securing nuts, and #4 (#13) reinforcing bars.

The distance between the base plate and the top of the stem shall not exceed 4 in. (100 mm). Do not use grout between the base plate and the top of the stem. The anchor bolt shall project 1/4 to 1 in. (6 to 25 mm) above the securing nut. See Figure 1, Figure 2, and Figure 3.

D. Foundations

Unless otherwise required on the Plans, design foundations as spread footings with an allowable soil bearing pressure of 3 KSF (140 kPa). Do not allow calculated bearing pressure to exceed the allowable soil bearing pressure. No overstressing will be permitted. Drilled shaft foundation shall be used when called for on the Plans and will require a soil investigation report that shall be included with your submittal. Drilled shafts shall not be used with Type II and V structures.

Unless otherwise shown on the Plans:

- The top of the footing shall be at least 2 ft (600 mm) below the finished ground surface.
- The bottom of the foundation shall be placed on or below the original ground or on fill compacted to at least 95 percent of the maximum laboratory dry density according to Section 208.
- The clearance between the anchor bolt assembly and the stem reinforcement shall be 2-1/2 in (65 mm) minimum.
- One foundation per structure shall have a minimum of 2 in (50 mm) rigid, galvanized steel conduits stubbed up 6 in (150 mm) above the stem and capped a minimum of 3 ft (1 m) outside the footing and a minimum of 18 in (450 mm) below the finished ground surface for connecting to the underground power source or for future use.

638.2 Materials

Except for the Type VII structure, all structural members shall be tubular shapes. All materials shall meet the requirements of the applicable Specification. Do not use a material until the Office of Materials and Research approves it.

Furnish one legible, reproducible copy of certified mill test reports including chemical analysis and physical test results covering steel and aluminum.

A. Aluminum Structures

Materials for aluminum structures shall comply with AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals.

B. Steel Structures

All components of steel structures shall be galvanized in accordance with ASTM A 123/A 123 M or ASTM A 153/A 153 M, whichever is applicable. All components galvanized in accordance with ASTM A 123/A 123 M shall be quenched immediately upon removal from the zinc bath. If the contract plans require painting of the structural supports, the structural supports shall be painted with an approved paint system after galvanization.

- Structural steel, including base plates—Shall meet the requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals.
- Steel pipe—Shall meet the requirements of ASTM A 53 Types E or S. Grade B; ASTM A 139 Grade B; ASTM A 252 Grade 2; API 5L-X42; or API 5L-X52. The hydrostatic requirements are waived. Other alloys of steel may be accepted if minimum yield strength of the material is less than or equal to 60,000 psi.
- Walkway and sign connection bolts including U-bolts—Shall meet the requirements of Subsection 852.2.

All other connections shall be made with high strength ASTM A 325 (A 325 M) bolts with washers and nuts meeting all the requirements of Subsection 852.2.

C. Anchor Bolts

Anchor bolts, nuts and washers shall meet the requirements of Subsection 852.2, or ASTM F 1554 (F 1554 M), A 563 (A 563 M) and F 436 (F 436 M), except that threads shall be rolled and shall be 8 UN/8 UNR thread profile according to ANSI B1.1). Bolts shall have Class 2A threads, and nuts shall have Class 2B threads.

The permanent template shall meet the requirements of ASTM A 709 Grade 36 or 50 (A 709 M Grade 250 or 345) or shall be an approved equal. Construct temporary templates from a material rigid enough to prevent any movement and misalignment of the anchor bolts.

D. Concrete Foundations

Class AA concrete shall comply with Section 500.

Reinforcement steel shall comply with Section 853, Grade 60 (420).

E. Silicone Caulking Compound

Silicone caulking sealant shall comply with Subsection 833.2.06.A.1.a.1), “Type A.”

F. Neoprene

Neoprene, or its approved equal, shall be approved by the Office of Materials and Research.

G. Ground Rods

Ground rods shall comply with Subsection 894.2.04.

H. Ground Wire

Ground wire shall comply with Section 922.

I. Threadlocker Adhesive

Threadlocker adhesive shall be an anaerobic threadlocking and sealing compound approved by the Office of Materials and Research.

J. Rigid Steel Conduit

Rigid steel conduit shall be a 2 in (50 mm) rigid steel conduit meeting the requirements of Subsection 923.2.01.A.2

638.2.01 Delivery, Storage, and Handling

During shipment and handling, protect the metal components to prevent bending the components and damaging the galvanized coating.

Handle galvanized steel components with rope slings or other methods approved by the Office of Materials and Research.

Do not use metal slings, chains, or hooks on galvanized surfaces.

Repair minor damage to galvanizing, as determined by the Engineer, according to Section 645. Extensive galvanizing damage is cause for rejection.

638.3 Construction Requirements

638.3.01 Personnel

General Provisions 101 through 150.

638.3.02 Equipment

General Provisions 101 through 150.

638.3.03 Preparation

A. Footings

Footings may be designed as spread footings with an allowable soil bearing pressure of 3 KSF (144 kPa). Include a soil investigation and report for other footings in the submittal.

1. Increase the allowable stress for group loading as given in Subsection 638.2.01. Disregard the gust factor.
2. The factor of safety in overturning shall be 1.15.
3. Unless shown otherwise on the Plans, extend the top of each footing at least 4 in (100 mm) above the ground. Place the footings to miss present and known future underground installations.
4. Stub at least two 2 in (50 mm) rigid, galvanized steel conduits up 6 in (150 mm) into the riser of one footing and cap at a distance of 3 ft (1 m) outside the foundation. Place the conduit at least 18 in (450 mm) below the ground level to connect to the underground power feed or for future use.

638.3.04 Fabrication

Fabrication of structural supports and anchor bolt assemblies shall be according to the approved shop drawings and the Plans. Only use fabricators of structural supports and anchor bolt assemblies that are listed on the Department's Qualified Products List as a qualified fabricator of structural supports and anchor bolt assemblies.

A. General

Use aluminum or steel supports for signs. Steel supports shall be galvanized after fabrication. Connections may be welded, bolted, riveted, or fastened by other means if the connecting method ensures adequate strength and does not distract from the aesthetics of the structure. Do not weld splice structural members.

Fabricate columns, chords, and struts from one piece of material by using one longitudinal seam weld. Bolted splicing of truss chords may be allowed if shown on approved shop drawings. Use struts to brace all truss chords.

Provide an electrical outlet on the front horizontal chord with a cover for connecting to the power source or for future use. Weld into the column near the base the column with the conduit in the foundation, a handhole assembly, curved on the front to follow the contour of the column. Ensure that the handhole reinforcing frame has a tapped hole to accommodate the grounding lug and secure a cover to the frame with at least two screws. The column shall have a J-hook wire support welded inside near the top.

Provide brackets for mounting signs. These brackets shall be adjustable to permit mounting the sign faces at any angle between a truly vertical position and three degrees from vertical. Obtain this three-degree angle by rotating the top edge of the sign downward toward approaching traffic. All brackets shall be equal in length to the vertical dimension of the signs being supported.

B. Welding

All welding shall be done in the shop by current GDOT certified welders. The welders will weld the steel structures according to the latest AWS Structural Welding Code as modified by the GDOT Specifications and will weld aluminum structures according to Subsection 638.1.02.

C. Fabrication and Testing

Fabricate components in a jig or fixture to prevent distortion during and after welding and to ensure exact alignment at the time of erection.

Carefully check welds by visual and non-destructive inspection, by destructive testing of weld samples fabricated during welding, or by other methods approved by the Engineer. Sufficiently test weld samples to verify the reliability of production welding.

D. Galvanizing

After fabrication, thoroughly clean and galvanize all components of steel structures, including clamps and brackets, using the hot-dip process according to ASTM A 123/A123 M or ASTM A 153/A153 M, whichever is applicable.

Clean and galvanize interior and exterior surfaces of hollow sections. All components galvanized according to ASTM A 123/A 123 M shall be immediately quenched when removed from the zinc bath.

Galvanize Type VII bridge mounted structural frames except where the support is attached to weathering steel. When attached to weathering steel, fabricate the support of ASTM A 709 Grade 50W (A 709 M Grade 345W) steel or paint with an approved paint system to match the color of the weathering steel after galvanization.

638.3.05 Construction

A. Protection of Metal

During shipment and handling, protect all metal components to prevent damage to galvanized coatings. Handle galvanized steel components with rope slings or alternate methods approved by the Office of Materials and Research before use. Do not use metal slings, chains, or hooks on galvanized surfaces.

Repair minor damage to galvanizing, as determined by the Engineer, according to Sections 645. Metal components will be rejected if they have extensive damage to galvanizing.

B. Foundations

For construction methods, see Sections 207, 500, and 511.

Chamfer the edges of the stems 3/4 in (19 mm). Stems shall have a Type III finish to at least 6 in (150 mm) below the finished ground surface unless otherwise noted on the Plans. The Engineer shall inspect the anchor bolt assembly installation before the placement of concrete. Complete the anchor bolt assembly installations so as to prevent movement during the concrete placement. Tolerance for the placement of anchor bolt assemblies shall be 3/8 in. (10 mm) horizontally and 1:20 (3 degrees) vertically. Do not remove the temporary template until the footing and stem concrete have been in place at least 24 hours.

The Office of Materials and Research shall inspect the Type II and V sign structure footings before the column is erected. The OMR will perform a second inspection after the column is erected, and will also perform ultrasonic testing of the anchor bolts at this time. Type II and V sign structures will not be accepted until the footing inspections have been performed and approved.

C. Erection

Erecting the structure shall include placing and leveling a leveling nut on each anchor bolt. Use a washer with each leveling nut. Set the column on the washers without the horizontal structure, and place and tighten a washer and securing nut on each anchor bolt. Tightening is turning the nut an eighth of a turn after the nut is snug tight, and then applying the threadlocker adhesive.

After tightening, inspect the connections to ensure full bearing of the top and the bottom washers on the base plate and to ensure that the distance between the top of the stem and the bottom of the base plate does not exceed 4 in. (100 mm). No structure will be accepted if this dimension is greater than 4 in. (100 mm).

Attach the horizontal structure to the column with ASTM A 325 (A 325 M) bolts. Install ASTM A 325 (A 325 M)bolts according to Subsection 501.3.04.F, “High-Tensile Strength Bolt Connections.” Do not reuse bolts and nuts after tightening them.

D. Type VII Bridge Mounted

Coat with silicone sealant all surfaces that are in contact with concrete. Separate with neoprene or an approved equal material all surfaces that are in contact with dissimilar metals.

E. Grounding

Install ground rods for each structural support adjacent to the foundation with the conduit as indicated below:

1. Vertically drive single, 8 ft (2.4 m) long ground rods until the top of the rod is at least 12 in. (300 mm) below the finished ground.
2. Attach a length of #6 bare copper, 7-strand wire to the ground with suitable ground rod clamps and connect it to the grounding nut of the column.
3. If sufficient penetration cannot be obtained in the above manner, place a ground rod system consisting of 3 parallel ground rods a minimum of 6 ft (1.8 m) center-to-center in a horizontal pattern and at least 12 in. (300 mm) below the finished ground. Join these rods and connect them to the grounding nut of the column with #6 bare copper, 7-strand wire and suitable ground rod clamps.

F. Finished Ground Surface

Ensure that the finished ground surface matches the typical section adjacent to the structural support. Do not adjust the ground surface around the stem to obtain 12 in (300 mm) minimum projection above finished ground surface.

638.3.06 Quality Acceptance

General Provisions 101 through 150.

638.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

638.4 Measurement

The quantity measured for payment shall be each structure type at the specified location completed and accepted. This shall include design, fabrication, and construction of structural supports including anchor bolt assemblies, foundations, excavation, backfill, redressing, and regrassing; but exclusive of signs.

638.4.01 Limits

General Provisions 101 through 150.

638.5 Payment

This item, measured according to Subsection 638.4, "Measurement," for each structural support for overhead highway signs, is paid for at the Lump Sum Contract Unit Price bid for the complete structure.

Payment will be made under:

Item No. 638	Structural support for overhead highway sign, type I–sta.___	Per lump sum
Item No. 638	Structural support for overhead highway sign, type II–sta.___	Per lump sum
Item No. 638	Structural support for overhead highway sign, type III–sta.___	Per lump sum
Item No. 638	Structural support for overhead highway sign, type IV–sta.___	Per lump sum
Item No. 638	Structural support for overhead highway sign, type V–sta.___	Per lump sum
Item No. 638	Structural support for overhead highway sign, type VI–sta.___	Per lump sum
Item No. 638	Structural support for overhead highway sign, type VII–sta.___	Per lump sum
Item No. 638	Structural support for overhead highway sign, type VIII–sta.___	Per lump sum

638.5.01 Adjustments

General Provisions 101 through 150.

Section 639—Strain Poles for Overhead Sign and Signal Assemblies

639.1 General Description

This work includes furnishing and erecting overhead sign and signal support strain poles and steel wire strand cable according to this Specification and the Plans.